

**Physics 10 2nd Midterm (200 pts MAX.) – TEST B**  
**Spring 2005**

1. A material might be made denser by (a) burning (b) stretching (c) heating (d) compacting
2. An automobile “fender bender” is an example of (a) plasticity (b) elasticity (c) Hooke’s law (d) sublimation
3. A solid that consists of covalently bonded atoms such that the solid consists of one large (a) macromolecular (b) micromolecular (c) amorphous (d) ionic
4. The alloy bronze is made up of (a) iron and carbon (b) copper and tin (c) copper and zinc (d) chromium and nickel
5. Pressure applied to an enclosed liquid is (a) described by an inverse square law (b) reduced with distance (c) transmitted undiminished (d) both (a) and (c)
6. A hydraulic jack is an application of (a) Archimedes' principle (b) Bernoulli’s principle (c) Pascal’s principle (d) Newton's principle
7. Liquids (a) have a definite volume (b) have no definite shape (c) are essentially incompressible (d) all of the above
8. Viscosity (a) decreases with increasing temperature (b) affects the pressure-depth relationship (c) is a factor in buoyancy (d) causes surface tension
9. One atmosphere of pressure will support a column of mercury how tall? (a) 30 cm (b) 76 in (c) 0.76 m (d) 760 in
10. The high pressure of the blood in its vessels is called (a) systolic (b) diastolic (c) barometric (d) atmospheric
11. The heart is effectively a (a) force pump (b) lift pump (c) barometer (d) vacuum cleaner
12. If the motions of two oscillators were opposite, we say they are (a) in SHM (b) in phase (c) out of phase (d) both (b) and (c)
13. The energy of a wave (a) is proportional to the square of its amplitude (b) is equal to  $Iat$  (c) falls off as  $1/r^2$  (d) all of the preceding
14. When driven at resonance, a rope vibrates (a) out of phase (b) at only one possible frequency (c) at only the 2<sup>nd</sup> harmonic or 2<sup>nd</sup> overtone (d) at maximum amplitude
15. The speed of sound is (a) independent of temperature (b) generally greater in liquids than in solids (c) on the order of 34 m/s in air (d) none of these
16. The speed of sound in air is 340 m/s. If a plane flies at a speed of 510 m/s, it has a Mach number of (a) 1.5 (b) 2.0 (c) 2.5 (d) 2.7
17. The speed of sound in air on a day when the air temperature is 25 degree C is (a) 331 m/s (b) 346 m/s (c) 352 m/s (d) 360 m/s
18. A Doppler "blue shift" occurs when (a) the source is moving away from a stationary observer (b) an observer is moving away from a stationary source (c) the observer and source are moving towards each other (d) the observer and source are stationary
19. Thermal expansion, or an increase in dimensions with increasing temperature, occurs (a) in most substances (b) in very few substances (c) only in metals (d) both (b) and (c)
20. Which of the following heat units is neither the largest nor the smallest? (a) kilocalorie (b) Btu (c) calorie (d) all are equal
21. The smallest temperature unit is (a) degree Fahrenheit (b) degree Celsius (c) the Kelvin (d) all are the same
22. One Kelvin unit is equivalent to (a) one degree Fahrenheit (b) 1.8 degree Celsius (c) 9/5 degree Fahrenheit (d) one BTU
23. The energy associated with a phase change is called (a) latent heat (b) specific heat (c) radiation (d) none of the preceding
24. Heat transfer takes place because of a difference in (a) potential energy (b) heat content (c) specific heat (d) temperature
25. Ice, water, and steam coexist at the (a) melting point (b) dew point (c) boiling point (d) triple point
26. Find the density of a 5-kg solid cylinder. The cylinder is 10 cm tall and has a radius of 3 cm. (a)  $17.7 \text{ kg/m}^3$  (b)  $17.7 \text{ g/cm}^3$  (c)  $17.7 \text{ kg/cm}^3$  (d)  $17.7 \text{ g/cm}$
27. How much longer would a 1-kg cube of aluminum be than a 1-kg cube of iron? (a) 43% longer (b) 20% longer (c) 86% longer (d) the same
28. Determine the mass of a gold sphere 0.10 m in diameter (density of Gold= $19.3 \times 10^3 \text{ kg/m}^3$ ) (a) 10 kg (b) 15 kg (c) 20 kg (d) 25 kg
29. When a 2.0-kg object is suspended in water, it “masses” 1.5 kg. What is the density of the object? (a)  $1000 \text{ kg/m}^3$  (b)  $4000 \text{ kg/m}^3$  (c)  $500 \text{ kg/m}^3$  (d)  $2000 \text{ kg/m}^3$

30. An object of volume  $V$  floats in water with a volume  $V_u$  up above the surface. Write an expression for its average density in terms of the density of water. Apply this solution to find the average density of a loaded barge with 20% of its volume above the waterline. (a)  $0.6 \rho_{H_2O}$  (b)  $0.7 \rho_{H_2O}$  (c)  $0.8 \rho_{H_2O}$  (d)  $0.9 \rho_{H_2O}$
31. What is the frequency in vibrations per second of 60-Hz wave? (a) 0.01666 sec (b) 60 sec (c) 0.0332 sec (d) 30 sec
32. Radio waves travel at the speed of light 300,000 km/s. What is the wavelength of radio waves received at 100.1 MHz on your FM radio dial? (a) 300,000 km (b) 100.1 km (c) 3 m (d) 100.1 m
33. A cello string 0.75m long has a 220-Hz fundamental frequency. Find the wave speed along the vibrating string. (a) 660 m/sec (b) 330 m/sec (c) 330 m (d) 660 m
34. What is the speed of sound at room temperature ( $20^\circ\text{C}$ ) and normal atmospheric pressure? (a) 331 m/sec (b) 331 m (c) 343 m/sec (d) 343 m
35. What will be the final temperature of 100 g of  $20^\circ\text{C}$  water when 100 g of  $40^\circ$  iron nails are submerged in it? (The specific heat of iron is  $0.12 \text{ cal/g } ^\circ\text{C}$ .) (a)  $31.4^\circ\text{C}$  (b)  $22.1^\circ\text{C}$  (c)  $22.1^\circ\text{F}$  (d)  $22.1^\circ\text{K}$
36. A 50-gram chunk of  $80^\circ\text{C}$  iron is dropped into a cavity in a very large block of ice at  $0^\circ\text{C}$ . How many grams of ice will melt? (The specific heat capacity of iron is  $0.11 \text{ cal/g}^\circ\text{C}$ .) (a) 50 gm (b) 5.0 gm (c) 5.5 gm (d) 10 gm
37. A European visitor reads that the average temperature of two different places in the United States is  $59^\circ\text{F}$ . He asks you what these temperatures are in Celsius. Could you help him? (a)  $59^\circ\text{C}$  (b)  $15^\circ\text{C}$  (c)  $45^\circ\text{C}$  (d)  $77^\circ\text{C}$
38. On a very hot day the temperature gets up to  $100^\circ\text{F}$ . A strict SI buff has his Kelvin thermometer along. What does it read? (a) 100K (b) 37.78K (c) 310.78K (d) 137.78K
39. A copper pot has a mass of 0.50 kg and is at  $100^\circ\text{C}$ . How much thermal energy must be removed from it if its temperature is to be lowered to precisely  $0^\circ\text{C}$ ? (a) -4.66 k-cal (b) -44.6 k-cal (c) -466 k-cal (d) -4,660 k-cal
40. A pane of window glass is 0.90 m wide by 1.5 m high and 4.0 mm thick. It's a cold blustery winter's day in the Midwest. The temperature of the inside face of the window is  $10^\circ\text{C}$ , and the outside face is at  $-9.0^\circ\text{C}$ . How much thermal power is being transported through the windows ( $k_T=0.84\text{W/m}\cdot\text{K}$ )? (a) 1.287 kc/sec (b) 12.87 kc/sec (c) 128.7 kc/sec (d) 1,287 kc/sec
41. A solid with its atoms or molecules in an orderly arrangement is called (a) amorphous (b) crystalline (c) polymer (d) plastic
42. Which type of solid is characterized by high melting points? (a) Ionic (b) Molecular (c) Polymer (d) All of the preceding
43. An amorphous solid has (a) a definite melting point temperature (b) an orderly array of particles (c) an X-ray diffraction pattern (d) a random particle arrangement
44. In applying a force to a solid it is common to speak of applying a stress, where stress is defined as the (a) applied force (b) force  $\times$  area (c) force/area (d) force/volume
45. The fundamental repeating units in large molecules are called (a) polymers (b) monomers (c) macromolecules (d) ionics
46. A fixed quantity of gas is held in a cylinder capped at one end by a movable piston. The pressure of the gas is initially 1 atmosphere (101 kPA) and volume is initially  $0.3 \text{ m}^3$ . What is the final volume of the gas if the pressure of the gas is increased to 3 atmospheres at constant temperature? (a)  $0.05\text{m}^3$  (b)  $0.1\text{m}^3$  (c)  $0.2\text{m}^3$  (d)  $0.3\text{m}^3$
47. A heat engine takes in 1200 J of heat from the high temperature heat source in each cycle and does 400 J of work in each cycle. How much heat is released into the environment in each cycle? (a) 1200 J (b) 800 J (c) 400 J (d) 1600 J
48. A hot plate is used to transfer 400 cal of heat to a beaker containing ice and water. 500 J of work are also done on the contents of the beaker by stirring. What is the increase in internal energy of the ice-water mixture? (1 Cal = 4.2 J) (a) 2180 J (b) 400 J (c) 500 J (d) 400 Cal
49. If the specific heat capacity of ice is  $0.5 \text{ Cal/g}^\circ\text{C}$ , and the heat of fusion of ice is 80 Cal/g, how much heat would have to be added to 200g of ice initially at a temperature of  $-10^\circ\text{C}$  to raise the ice to the melting point? (a) 1000 Cal (b) 8000 Cal (c) 17000 Cal (d) 16000 Cal
50. Suppose that a merry-go-round is accelerated at a constant rate of  $0.005 \text{ rev/s}^2$ , starting from rest. What is its rotational velocity at the end of 1 min? (a) 0.005 rev/sec (b) 0.10 rev/sec (c) 0.30 rev/sec